

Watershed Field Assessment Report Pequonnock River Watershed

City of Bridgeport

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West Springfield, MA 01089

In Cooperation With:

Pequonnock River Initiative

Table of Contents

Watershed Field Assessment Report Pequonnock River Watershed

1	Introduction	1
2	Watershed Field Inventories	1
2.1	Summary of Findings	4
2.2	Stream Corridor Assessment	7
2.2.1	Upper West Branch Pequonnock River	11
2.2.2	Upper Pequonnock River	13
2.2.3	Middle Pequonnock Tributaries	15
2.2.4	Middle Pequonnock River	18
2.2.5	Upper Booth Hill Brook	19
2.2.6	Thrushwood Lake	21
2.2.7	Island Brook	22
2.2.8	Lower Pequonnock River	28
2.3	Upland Assessments	30
2.3.1	Neighborhood Source Assessment	31
2.4	Hotspot Site Investigation	39
2.5	Streets and Storm Drain Assessment	47
3	References	51

Tables		Page
2-1	Field Inventory Nomenclature	2
2-2	Number of Reach Level Assessments Performed and Impact Conditions Identified	9
2-3	Stream Reach Classifications	10
2-4	Stream Reach Assessment Scores and Classifications	10
2-5	Neighborhood Source Assessment Summary	31
2-6	Hotspot Site Investigation Summary	39

Figures		Page
2-1	Priority Subwatersheds Targeted for Field Inventories	3
2-2	Stream Assessment Summary	8
2-3	Examples of Stream Reaches in Various Classification Categories	10
2-4	Streets and Storm Drain Assessment Photographs	48

Appendices		End of Report
A	Field Inventory Subwatershed Maps	
B	Stream Corridor Assessment Field Data Forms	
C	Upland Assessment Field Data Forms	
D	Photographs on CD	

1 Introduction

During the Summer of 2010 the Pequonnock River Initiative (PRI) was formed as a partnership between the City of Bridgeport and the towns of Monroe and Trumbull to develop a Watershed-Based Plan for the Pequonnock River watershed. The watershed plan will ultimately identify action items to protect and improve the health of the Pequonnock River watershed.

The City of Bridgeport, through a Clean Water Act Section 319 grant from the Connecticut Department of Environmental Protection (CTDEP), retained Fuss & O'Neill, Inc. to perform the technical components of the watershed plan development. The CTDEP also awarded a Clean Water Act Section 604(b) grant with funding from the American Recovery and Reinvestment Act to Save the Sound, a program of Connecticut Fund for the Environment, Inc. and the Southwest Conservation District for performing education and outreach, organizing and facilitating the Pequonnock River Coalition to participate in the project, and assisting in the development of the watershed plan recommendations.

Additionally, Harbor Watch/River Watch, a program of Earthplace, The Nature Discovery Center at Westport, received 319 funding through the U.S. Environmental Protection Agency (EPA) to perform water quality monitoring of the Pequonnock River in 2009 and 2010. The monitoring data will be used to assess current water quality conditions in the Pequonnock River and ultimately guide the watershed plan recommendations.

Three separate watershed assessments are being performed to guide the development of a watershed management plan for the Pequonnock River: 1) a Baseline Watershed Assessment, 2) a Watershed Field Assessment, and 3) a Land Use Regulatory Review. The Baseline Watershed Assessment evaluates the existing environmental and land use conditions in the watershed, while the Land Use Regulatory Review identifies potential land use regulatory mechanisms that can be implemented to better protect natural resources within the watershed.

This document, the Watershed Field Assessment Report, describes stream corridor and upland assessments conducted by the project team to identify targeted and site-specific opportunities for watershed protection and restoration. This report is a companion document to the Baseline Watershed Assessment and Land Use Regulatory Review reports.

2 Watershed Field Inventories

Field inventories were performed by the Fuss & O'Neill project team during the Fall of 2010 to further assess existing watershed conditions and potential sources of pollution. The field inventories are a screening level tool for locating potential pollutant sources and environmental problems in a watershed along with identifying possible locations where restoration opportunities and mitigation measures could be implemented.

The field inventories included selected stream corridors and upland areas within priority subwatersheds, which were identified in the Baseline Watershed Assessment report based on a comparative subwatershed analysis that considered vulnerability to future development impacts and restoration potential to improve upon existing conditions. Field inventories were performed within the following priority subwatersheds (*Figure 2-1*):

- Island Brook
- Lower Pequonnock River
- Middle Pequonnock River
- Middle Pequonnock Tributaries
- Thrushwood Lake
- Upper Booth Hill
- Upper West Branch Pequonnock River

The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (Kitchell & Schueler, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (Wright, Swann, Capiella, & Schueler, 2005).

The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to the streams. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land. Field inventory nomenclature used throughout this report is summarized in *Table 2-1*.

Table 2-1. Field Inventory Nomenclature

Upper Pequonnock River	UPR	Reach Level Assessment	RCH
Upper West Branch Pequonnock River	UWB	Channel Modification	CM
Lower West Branch Pequonnock River	LWB	Severe Bank Erosion	ER
Middle Pequonnock Tributaries	MPT	Impacted Buffer	IB
Middle Pequonnock River	MPR	Stormwater Outfall	OT
Upper Booth Hill Brook	UBH	Stream Crossing	SC
Lower Booth Hill Brook	LBH	Trash & Debris	TB
Thrushwood Lake	THR	Utilities	UT
Island Brook	ISL	Hotspot Investigation	HSI
Lower Pequonnock River	LPR	Neighborhood Site Assessment	NSA
		Streets and Storm Drains	SSD
		Retrofit Reconnaissance Inventory	RRI

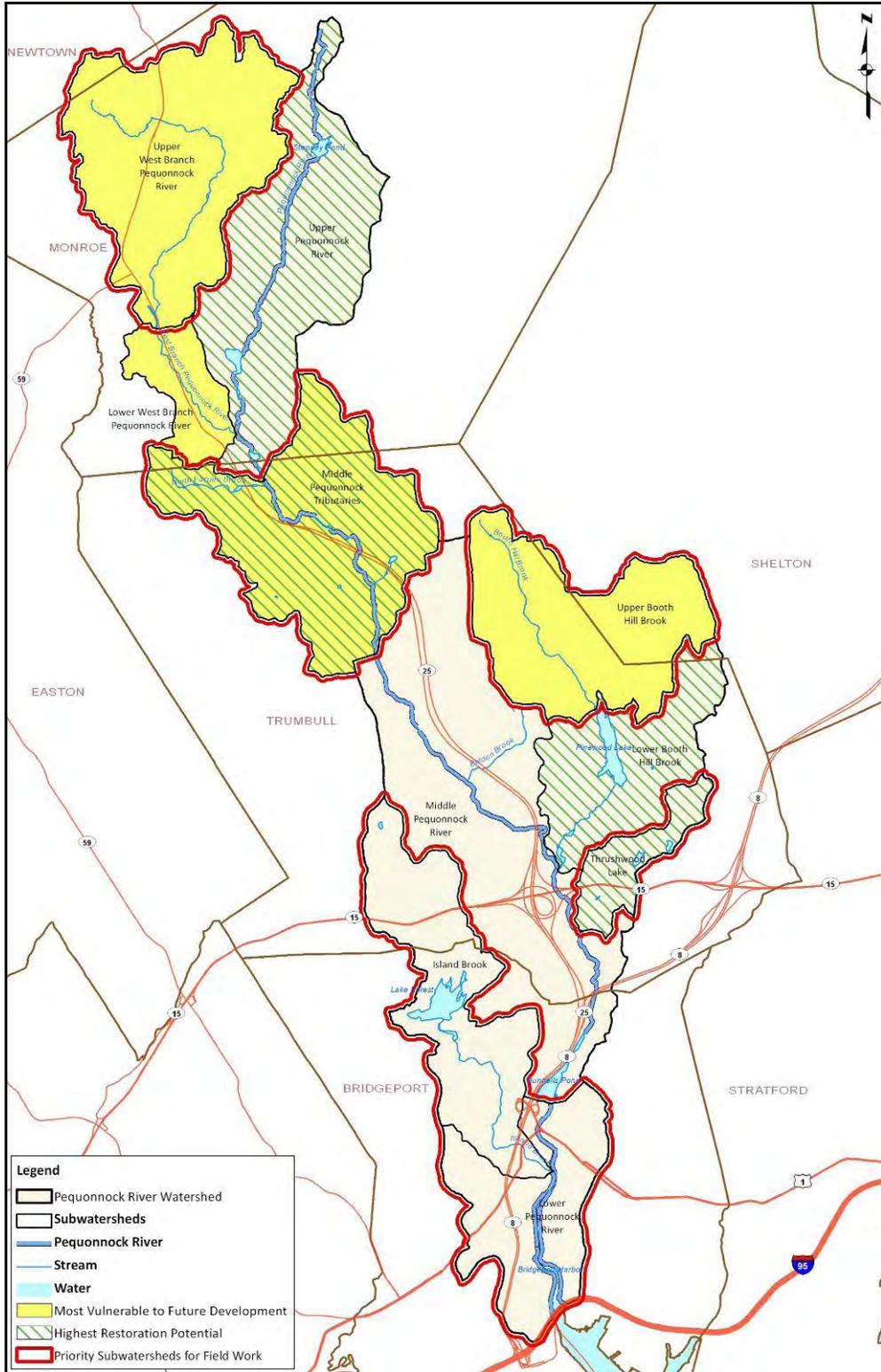


Figure 2-1. Priority Subwatersheds Targeted for Field Inventories

During the field inventories, crews assessed approximately eight miles of stream corridors, eighteen potential hotspot locations, thirteen representative residential neighborhoods, and thirteen streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses.

Results of the field inventories are summarized graphically by subwatershed (*Appendix A*). Copies of completed stream and upland assessment forms are provided in *Appendix B* and *Appendix C*, respectively. Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are included on a CD in *Appendix D*.

2.1 Summary of Findings

A variety of common issues and problems were identified during the field inventories. Some prevalent issues throughout the watershed are described below. These findings will be used to guide the development of recommendations for the Watershed Management Plan.

- **Lack of Stream Buffer**

Stream buffer encroachments are prevalent along stream corridors in many areas of the Pequonnock River watershed and are most often associated with residential, commercial, and industrial development and roads. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas. Industrial facilities along the Lower Pequonnock River have parking lots and fencing to the stream bank.

The high level of stream buffer encroachment along the streams in the Pequonnock River watershed has a significant impact on the overall stream and habitat conditions. In general, larger natural buffers are associated with better stream health, including channel substrate, flow regime, water quality, and shading, as well as better upland and wetland habitat through providing larger areas available to native flora and fauna.

- **Stream Channel Modification**

A significant amount of stream channel modification was observed throughout the watershed. Segments of some streams in the watershed are buried in underground conduits, resulting from historical development and past storm drainage practices and flood control practices. These include instances of entirely underground concrete channel culverts comprising reaches LPR-05/06 and ISL-02. The possibility of daylighting these sections is low since roadways and shopping centers have been built above the culverts.

There are many concrete or rip-rap lined channels and banks throughout the watershed. One example is the rip-rap armored bank upstream of the entrance into Wolfe Park. The majority of the channel modification is believed to have been constructed to prevent bank erosion and flooding due to upstream development. Some of these channels have the potential to be restored to a more natural condition by removing the armoring, restoring a floodplain, and implementing bioengineering techniques to provide a measure of stability for the channel.

- **Bank Erosion**

Areas of moderate to severe stream bank erosion were observed in the Pequonnock River watershed. Most of these areas are located at or downstream of stormwater outfalls or in areas with riparian buffers that are severely compromised. Several of these reaches offer good opportunities for stream restoration projects. Access to some of these areas is limited; therefore, potential candidate sites for bank stabilization projects and other types of stream restoration should be evaluated further for overall feasibility.

- **Trash and Debris**

Dumping of trash and debris in and adjacent to the stream is a significant problem, especially in the Island Brook subwatershed. In more urbanized areas of the watershed, widespread areas of trash and associated debris were observed within the stream corridor, whereas in more suburban settings, trash and illegal dumping appears to be more isolated such as near hotspot locations with poor visibility from roadways and buildings.

- **Fish Passage**

Stream continuity for fish passage has been severely compromised in many areas of the watershed, preventing fish passage to the middle and upper reaches of the watershed. The first obstruction encountered in the Lower Pequonnock River is the concrete-lined channel that has very shallow flow during low-flow periods in reach LPR-04. The cement culvert just upstream of the box culvert was determined to be a fish barrier due to the low flow. There is a proposed project to construct a fish apron to increase the depth of flow in the channel during periods of the low flow. A fish ladder has been installed upstream of this reach to allow fish passage at Bunnell's Pond Dam.

Many of the upper portions of the Pequonnock River and its tributaries have long reaches of unobstructed stream. However, in other areas of the upper watershed, obstructions such as road crossings, dams, and long culvertized reaches exist along the river that limit or prevent passage of fish and other aquatic organisms. These obstructions could be modified to improve passage of eel and resident fish species. Additionally, several of the dams no longer serve a purpose, and removal could benefit in-stream habitat and fish passage.

- **Commercial and Industrial Land Uses**

Hotspot land uses and facilities were observed throughout the watershed, including several industrial facilities in the Lower Pequonnock River subwatershed. Many of these facilities discharge stormwater directly to receiving waters with no treatment or peak flow control, and the level of maintenance of existing controls in some areas are poor.

- **Residential**

Lawn-care maintenance practices in residential areas of the watershed varied significantly. Some neighborhoods with townhouses or newer subdivisions with single-family homes have high management of turf. Manicured lawns are common in medium- to low-density residential areas, suggesting the prevalent use of fertilizer and

other lawn care products, as well as permanent irrigation systems. Opportunities exist to educate the public about the impacts of lawn care practices on water quality and to encourage the use of residential lawn care best management practices, with the objective of reducing excess fertilizer runoff and the overall quantity of runoff from residential lawns.

Residential roofs appear to contribute significant quantities of stormwater runoff to the storm drainage system, particularly in higher-density residential neighborhoods with smaller yards and lots with a high percentage of impervious cover. In the older neighborhoods of Bridgeport, roof leaders of many residences appear to direct roof runoff into the internal plumbing of the structure, which is indicative of connections to the sanitary sewer system. Opportunities exist to disconnect residential rooftop runoff from the sanitary sewer system and/or combined sewers, as well as from the storm drainage system altogether, by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

- **Low Impact Development (LID) Opportunities**

Parking lots associated with existing athletic facilities, industrial facilities, commercial developments, as well as municipal parking areas are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other small-scale Low Impact Development (LID) and green infrastructure approaches. Candidate stormwater retrofit sites exist in virtually all of the assessed subwatersheds but are most prevalent in the Lower Pequonnock River, Middle Pequonnock River, Middle Pequonnock Tributaries and Island Brook subwatersheds.

Although conventional stormwater drainage systems with no treatment capability are prevalent throughout the watershed, there are also several examples of stormwater treatment practices in the watershed. A few of the best examples are the dry detention ponds located on Quarry Road in Trumbull at the Bow-Tie Cinema and Helicopter Service Inc. One example of LID site design practices was observed at the Beardsley Zoo at the Hanson Exploration Station building, the grounds of which included rain gardens planted with native species.

- **Storm Drain Stenciling**

The field assessments identified few areas in the watershed where storm drains are stenciled or watershed stewardship signage exists. Storm drain stenciling and/or stewardship signage could be expanded to other areas of the watershed, targeting commercial areas along Route 25 in Monroe and shopping centers and residential subdivisions in Bridgeport. Interpretive educational signage is also recommended in key public areas of the watershed.

The following sections present a more detailed discussion of the stream corridor and upland assessment methods and findings.

2.2 Stream Corridor Assessment

Stream corridors within the Pequonnock River watershed were assessed on September 23rd, 24th, 27th, and 29th and October 5, 2010. September was a dry month, with less than 0.2 inches of precipitation occurring in the Bridgeport area prior to September 27th. Therefore, the flowrate in the streams assessed during September 23rd and 24th were lower than average. Significant storm events occurred on September 27th and 30th resulting in higher flows in the streams on September 29th and October 5th. Stream corridors were assessed along selected reaches within priority subwatersheds using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005). Twenty-three stream reaches were evaluated in the Pequonnock River watershed using this stream assessment protocol. The reaches assessed are shown in *Figure 2-2*.

The purpose of these assessments is to evaluate stream reaches for impacted conditions. The method used in this study consisted of a continuous stream walk for each reach, generally moving upstream within the channel or along the bank, to identify and evaluate the following impact conditions:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, road crossings with the stream piped in a culvert, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified;
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

This stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Field data forms were completed for each stream reach assessed (*Appendix B*). The information was compiled and used to quantify the overall condition of stream corridors in the watershed, compare subwatersheds within the watershed to each other, and prioritize areas for restoration, stormwater retrofits, land preservation, and other stewardship opportunities.

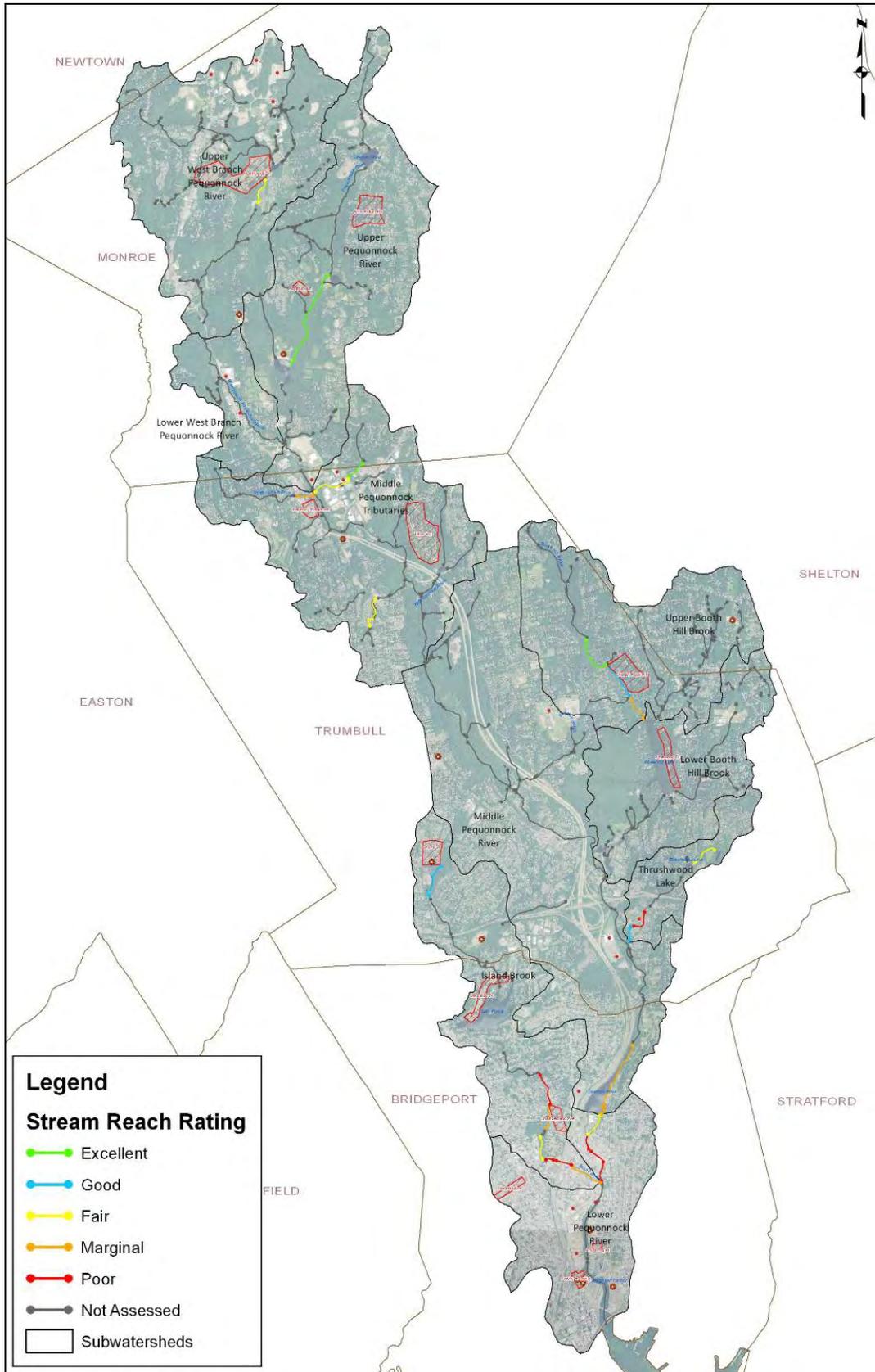


Figure 2-2. Stream Assessment Summary

Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from upstream to downstream in series by stream order. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach.

Impact conditions within each reach were numbered sequentially with an abbreviation followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02. *Table 2-2* summarizes the number of impact conditions identified and reach level assessments that were performed within each subwatershed.

Table 2-2. Number of Reach Level Assessments Performed and Impact Conditions Identified

Subwater-shed	RCH	CM	IB	MI	OT	ER	SC	TR
UPR	1	1	1	-	1	1	3	1
UWB	3		4	-	2		4	-
MPT	4	4	5	-	15	1	10	1
MPR	1	1	2	-	14	2	-	1
UBH	3	2	6	-	9	7	7	-
THR	3	1	3	-	3	3	5	1
ISL	6	1	4	-	14	4	6	4
LPR	3	4	2	1	10	-	3	2
Total	24	14	27	1	68	18	38	10

Reach level assessment scores were assigned by field crews based upon the overall stream, buffer, and floodplain conditions. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 indicating poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points.

Streams were assessed relative to a base condition, which for this study, is the highest scoring stream reach in the Pequonnock River watershed (156 points). All other assessed stream reaches were assigned a numerical score and categorized relative to the statistical percentiles (*Table 2-3*) of the obtained dataset. Reaches scoring greater than the 90th percentile (118 points) are considered “excellent”, between the 75th and 90th percentile are categorized as “good”, between the 50th and 75th percentile are categorized as “fair”, and between the 25th and 50th percentile are categorized as “marginal”. Total reach scores of less than the 25th percentile (47 points) are categorized as “poor”. *Table 2-4* summarizes stream reach assessment scores and classifications for the assessed stream reaches. The stream assessment results for the entire watershed are also shown graphically in *Figure 2-2*. *Appendix A* contains maps depicting the stream assessment results in each subwatershed.

Table 2-3. Stream Reach Classifications

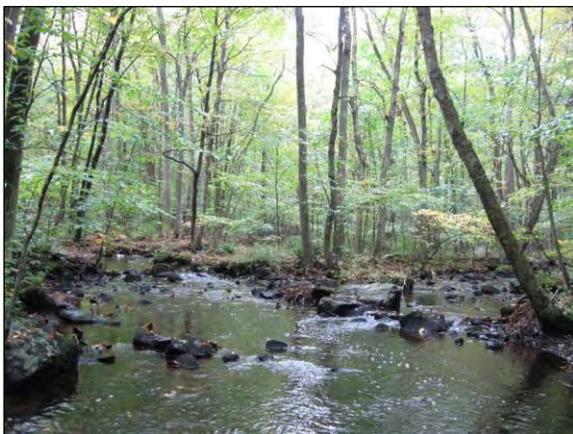
Category	Percentile	Point Threshold
Excellent	90%	≥ 118
Good	75%	≥ 110
Fair	50%	≥ 96
Marginal	25%	≥ 47
Poor	< 25%	< 47

Table 2-4. Stream Reach Assessment Scores and Classifications

Excellent		Good		Fair		Marginal		Poor	
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
UPR-05	156	ISL-12	116	ISL-03	109	UBH-01	87	ISL-03B	46
MPT-25	118	THR-01	114	THR-04	104	MPT-19	82	ISL-06	46
UBH-03	118	UBH-02	111	MPT-24	98	ISL-04	67	THR-02	44
				LPR-07	97	MPR-01/02	66	LPR-04	21
				UWB-03	97	ISL-01	48	ISL-02	0
				MPT-09	96			LPR-05/06	0

The Pequonnock River subwatershed has a high degree of variability in stream conditions along the main stem of the Pequonnock River. As indicated in *Table 2-4*, Upper Pequonnock River (UPR-05) is the highest rated stream reach (“Excellent”) due to mature floodplain forest along a wide riparian corridor and generally optimal floodplain, buffer, and in-stream habitat conditions. The Lower Pequonnock River reaches LPR-04 is rated “poor” due to a lack of buffer and floodplain in the urbanized section of Bridgeport. LPR-05/06 received a score of “zero” since the reach is a culverted section of stream that is routed underneath Route 8 and a shopping center. The photographs in *Figure 2-3* illustrate the sharp contrast in conditions within this subwatershed.

The following sections summarize the major issues identified during the stream corridor assessments for each priority subwatershed. Specific locations are identified according to the stream reach and impact condition IDs described previously. Identification of “right” and “left” stream banks is from the observer’s perspective facing downstream.



UBH-02: Good



UPR-05: Excellent



LPR-03: Fair



ISL-04: Marginal



THR-02: Poor



ISL-02: No Value

Figure 2-3. Examples of Stream Reaches in Various Classification Categories

2.2.1 Upper West Branch Pequonnock River

The Upper West Branch Pequonnock River is a major headwaters tributary to the Pequonnock River located entirely within the Town of Monroe. The subwatershed is a secondary source public water supply watershed for Aquarion Water Company and therefore access to the streams is limited.

UWB-01

The Upper West Branch Pequonnock River reach UWB-01 begins at Pepper Street and flows to the Aquarion water intake structure and dam along Route 25 in Monroe. Since access was limited to this privately-owned stream, the stream assessment was limited to the area in the vicinity of the intake structure. An approximately 3-foot high broad-crested weir creates a complete fish barrier at this location. There are two outfalls from road drainage flowing into the stream on the downstream side of the dam. The overall stream condition was not assessed.

UWB-03

Upper West Branch Pequonnock River reach UWB-03 flows from the outlet of the lower stormwater pond at the Northbrook townhouse complex through a low-density residential area along the rear of a few residential properties. The stream crossed the rail-trail beneath a decommissioned railroad crossing which has a large downstream scour hole. The stream then flows along the edge of a private grass field, under a driveway crossing, and through a rip-rap lined channel to a small pond. The entire reach is bordered by privately-owned lands. The biggest problems in this reach are caused by the impaired buffers and channel modifications along the majority of the stream bank.

These deficiencies include rip-rap along the banks, turf planted to the stream bank, and retaining walls replacing the natural bank (one was constructed from milk crates). One residential property that abuts the stream constructed a driveway bridge over the stream for access across the property.



The lower stormwater pond at the Northbrook Townhouses marking the upstream end of UWB-03.



Concrete retaining wall along UWB-03.



Concrete retaining wall along UWB-03.



Retaining wall constructed of milk-crates filled with rocks and cement along UWB-03.



Recently constructed rip-rap channel downstream of the Northbrook Townhouses.

The land-owner at the downstream end of this reach expressed concern over the recent flooding on his property, which prompted the rip-rap channel shown in the photograph above and expressed willingness to cooperate in restoration efforts. There is ample space along the lower half of the reach for stream restoration if property owners are cooperative. The overall stream condition rating for this reach is “Fair”.

2.2.2 Upper Pequonnock River

The Upper Pequonnock River watershed is the headwaters of the Pequonnock River. The upper portion of the watershed has some development including industrial uses. Only one reach was assessed in this subwatershed, UPR-05.

UPR-05

Upper Pequonnock River (UPR) reach UPR-05 is approximately 0.78-miles in length and flows from the Stream Crossing at Cutlers Farm Road, through Wolfe Park, and discharges to Great Hollow Lake. The reach from Cutlers Farm Road to the entrance of the recreational area of Wolfe Park is forested with a wide buffer and excellent instream and floodplain characteristics. Approximately 0.1 mile upstream of the confluence with Great Hollow Lake the stream characteristics change due to bank erosion and channelization likely caused by the removal of the stream buffer to plant grass for a park area. One side of the bank has been armored with approximately 8 to 10 feet of stone rip-rap in this area. The stream is generally well-shaded throughout the reach since the development is limited.

This stream is rated “Excellent” and can be considered a reference stream for the Pequonnock River watershed. Besides the eroded and channelized bank, minor issues along this stream segment included:

- There was one site with a metal appliance in the stream near Cutlers Farm Road

- A footbridge and gravel road cross the stream in Wolfe Park which may introduce sediment sources and oil and grease into the stream from passing park-related vehicles



UPR-05 is considered a reference stream with excellent stream buffer distance, canopy cover, and instream habitat.



The bank is armored with rip-rap upstream of the entrance into Wolfe Park.

2.2.3 Middle Pequonnock Tributaries

The Middle Pequonnock River Tributaries subwatershed is composed of many small tributaries that discharge to the Pequonnock River in the middle section of the watershed including North Farrars Brook and Katz Ice Pond Brook. The majority of the subwatershed is located within the Town of Trumbull. Four reaches were assessed in this subwatershed, including MPT-09, MPT-19, MPT-24, and MPT-25.

MPT-09

Reach MPT-09 is a 0.31-mile reach that flows southwest to northeast along an unnamed tributary to the Pequonnock River. The reach flows through the Governor's Ridge subdivision, originating from a recreational pond behind a few houses on a cul-de-sac at the end of the subdivision and ending in a significantly-sized stormwater pond adjacent to Route 111, just upstream of the Route 111 stream crossing. There is moderate disturbance due to development throughout the reach, most notably due to channel modifications using rip-rap to stabilize the banks. It appears that some of the bed material was placed in the stream channel to correct former sedimentation problems due to the sandy bed material and increased flow caused by upstream development.

A significant portion of this reach has been disconnected from the floodplain by the channel modifications, which may be exacerbating the flooding and erosion issues along this reach rather than mitigating the problems. Removal of placed boulders along the bank in areas where the adjacent ground is low would allow the stream to enter the wetland floodplain along the right bank, restoring natural hydrology. The exposed banks would need to be protected with plantings or other soft measures to prevent erosion.

There are a high density of outfalls along this reach which drain areas of the subdivision and a commercial building. Scour is present along the bank and in the stream near outfalls OT-02 and OT-04 that appears to have resulted for the outfalls. Stream crossing SC-01 serves as grade control for upstream pond and prevents any fish passage from the pond to the stream. There is a moderate amount of trash and debris along the entire reach, including a small metal barrel in the wetland area, various bottles and toys, a small bicycle, golf balls, chairs, a broken PVC pipe, yard waste and potted plants.

MPT-09 is rated "Fair" due to stream channelization and lack of floodplain connectivity. Another issue along this reach is the illegal dumping of household trash into the stream.



Man-made pond at the downstream end of MPT-09 at the entrance of the Governor's Ridge subdivision.



The concrete flared end segment of outfall OT-04 has collapsed and is no longer connected to the storm system.

MPT-19

Reach MPT-19 is a segment of North Farrars Brook that flows from west to east parallel to Spring Hill Road from Route 25 (Main Street) to the confluence with the main stem of the Pequonnock River. The segment originates at a stream crossing at Route 25 with a circular 4 foot metal culvert and flows into an open channel lined with stone walls (CM-01) and then into a small, approximately 8,000 square-foot pond with a man-made stone dam providing the grade control and preventing fish passage. The stream flows from the stone check dam into a small natural channel and then flows underneath a parking lot in a concrete culvert, eventually discharging to the Pequonnock River not far downstream of the parking lot.

MPT-19 is rated “marginal” due to the numerous stream crossings and significant channelization with the stone channel and the underground segment beneath the parking lot. There would be high potential for stream restoration along this reach if the property were not privately owned.



CM-01 downstream of Route 25 stream crossing.

MPT-24

Reach MPT-24 is a segment of a small tributary on the eastern side of the Pequonnock River that flows from east to west. The upstream end of the reach is located near the intersection of Spring Hill Road and Cutlers Farm Road on the side of an industrial/business park. The channel has been modified by placing stone bed material into the channel and armoring the banks with gabion walls.

The stream flows behind two office buildings parallel to Spring Hill Road within the gabion-walled stream channel. The stream in this section has an invasive species problem due to impacted buffer. This is a good restoration candidate to remove invasive species and plant a stream buffer to provide canopy cover to lower water temperatures. A large open-channel outfall discharges to the stream in the rear of the office buildings, likely coming from other office and industrial buildings upstream. The outfall channel has also been lined with stone. Another nearby outfall (OT-03) has dry-weather flow possibly coming from groundwater from beneath the buildings.

The stream enters a large wet detention pond prior to crossing Trefoil Road through three 5 foot culverts and emerges in a pool lined with concrete and gabion walls. The stream then flows through a natural channel adjacent to Spring Hill Road for approximately 500 feet before discharging to the Pequonnock River. MPT-24 is rated "Fair".



SC-01 crosses Trefoil Road in three 5 foot culverts.

MPT-25

MPT-25 flows from the stream crossing at Spring Hill Road, past a residence and an industrial park, crosses beneath the driveway of a landscaping company and discharges to MPT-24 near the intersection of Spring Hill Road and Cutlers Farm Road. The biggest problem in this reach is the impacted buffer associated with residential and industrial/commercial land uses. The stream has been channelized just downstream of the Spring Hill Road crossing using a stone wall to retain both banks. This modification is likely more than 50 years old.

Both upstream and downstream of the bank channelization severe bank erosion is evident with undercut banks. It appears that residential land owners have attempted to secure the areas of the bank that are eroding with the addition of more stone wall, although the efforts do not appear successful. The reach is crossed by Spring Hill Road, a footbridge, and two driveways. Stream crossing SC-02 and SC-03 associated with the footbridge and the residential driveway are candidates for restoration to remove the fish barrier and stabilize the bank erosion. The overall stream conditions for reach MPT-25 is “Excellent” due to good buffer distance, canopy cover, in-stream habitat, and floodplain connection.



SC-03 is a 36" concrete culvert crossing a driveway.



An example of the bank erosion downstream of the channelized banks.

2.2.4 Middle Pequonnock River

Two reaches in the Middle Pequonnock River subwatershed were assessed and then combined into one reach since the two reaches have similar characteristics. The combined reach is situated along Bunnell's Pond in Beardsley Park, Bridgeport.

MPR-01/02

Bunnell's Pond is an approximately 33-acre waterbody contained by Bunnell's Dam. Reach MPR-01/02 was assessed from the eastern edge of the Pond along the entire length. Overall, the buffer width along the pond's banks is insufficient, providing at most 10 feet of herb/shrub buffer. The southeastern side of the pond has trees providing some canopy cover and turf planted around the trees as shown in the photograph below. There is trash and debris along the reach from park visitors including; cups, cigarette packs, grocery bags, shoes, etc.

There were 14 outfalls observed along the reach located around the pond, many conveying runoff from Route 25/Route 8 into Bunnell's Pond ranging in size from 8-inch to 5-foot in diameter.

Reach MPR-01/02 is rated “Marginal”.



Bunnell's Pond has impaired buffer along the eastern side.

2.2.5 Upper Booth Hill Brook

The Upper Booth Hill Brook subwatershed is located in a single-family residential area of Trumbull and Shelton. Three stream reaches were assessed in the subwatershed, UBH-01, UBH-02, and UBH-03, which discharges to Pinewood Lake.

UBH-01

Stream segment UBH-01 flows from a stream crossing beneath Strobel Road follows parallel to Hemlock Trail, crosses Old Dike Road and then discharges to Pinewood Lake. Fish were observed along this reach including black-nosed dace, brook trout, and brown trout. Just downstream of the crossing with Strobel Road, there are many stream alterations, including a stone wall along the bank for reinforcement, footpaths which cross the stream, and impacted buffers due to residential lawns. One area of the reach has remnants of a concrete dam (SC-03) that has partially washed out. One side of the dam remains and is altering the flow, causing a scour hole downstream of the obstruction. The stream reach is rated “Marginal” due to suboptimal stream conditions and marginal buffer width and floodplain connection.



IB-01 and CM-01



Concrete dam (SC-03)



SC-01 is a twin 72-inch culvert for the stream crossing at Strobel Road, marking the beginning of the reach.

UBH-02

Stream reach UBH-02 flows from the location where a small tributary converged with the stream on the left bank to the stream crossing at Strobel Road. The stream channel is composed of mostly cobble and the stream is mostly shaded throughout the reach. There are two areas of impacted buffer along the reach in residential areas. IB-01 is an impacted stream buffer due to turf/lawn and growth of *Pachysandra* up to the stream bank. IB-02 is also impacted by lawn close to the bank, and the stream is approximately 90 feet from a house. There are three outfalls along this reach. OT-01 is a small tributary coming from an unnamed gravel road. The 24-inch pipe sits approximately 3 feet above the stream channel and is causing scour and erosion near the outfall. OT-03 discharges runoff from Shelter Rock Road through a 16-inch concrete pipe and the discharge is eroding a small channel downstream of the outfall.

Reach UBH-02 is rated suboptimal for in-stream habitat, vegetative protection, bank erosion and floodplain connection since the reach has some buffer between the nearby homes. The floodplain habitat is rated optimal, with a good mix of wetland and non-wetland plants. The overall stream rating for UBH-02 is “Good”. The biggest problem in this reach is scour and erosion around outfalls.



Tributary outfall OT-01 has an approximately 3-foot drop to the channel which is causing erosion and scour around the outfall.

UBH-03

Reach UBH-03 flows from the stream crossing at Old Field Road to the small tributary near the unnamed gravel road at the upstream end of reach UBH-02. The stream buffer along this reach is over 400 feet in some places and is greater than 50 feet along the entire reach. There are three areas of bank erosion that are caused from upstream modifications. ER-01 is bank scour that is along a meander bend downstream of OT-02. Upstream controls on OT-02 could correct the problem. ER-02 is believed to be caused by increased runoff from Brookbend Road. ER-03 is the most problematic section of bank erosion which is caused by the remnants of a former concrete dam. A large pool and sediment deposition are present downstream of the obstruction. The overall rating for this stream reach is “Excellent” due to the good in-stream and floodplain habitat and optimal floodplain buffer width.



An example of an undercut bank caused by an outfall located upstream of this bank.

2.2.6 Thrushwood Lake

A tributary to the Pequonnock River flows through the Thrushwood Lake subwatershed, crossing the Merritt Parkway, Unity Park, and areas of forested and residential land use. The stream segments that were assessed include THR-01, THR-02, and THR-04.

THR-01

Stream reach THR-01 flows from the end of Bayberry Lane to the outlet of the subwatershed at the confluence of the tributary with the Pequonnock River. The stream crossing underneath Bayberry Lane has a large scour hole on the downstream side. There is a small stormwater detention pond just downstream of the stream crossing and there are widespread invasive plants around the detention pond. Trash was observed throughout the reach, including cans, bottles, garbage bags, metal scraps, Styrofoam, etc. The stream cleanup could be performed by volunteers with trash bags. The overall rating for this reach is “Good”. The reach is mostly shaded with a variable bed substrate and some minor sediment deposition evident. A portion of the reach is a braided channel with good floodplain characteristics. There is little evidence of bank erosion and good floodplain connection throughout the reach.

THR-02

Stream reach THR-02 flows from the outlet of the dam and pond north of Unity Park, past the baseball fields in Unity Park and then flows behind the homes on Bayberry Lane, ending at the stream crossing with Bayberry Lane. The channel has been modified downstream of the dam with the addition of a mortared stone channel on both sides of the stream to armor the banks from potential scour downstream of the dam outlet. There is severe bank erosion adjacent to the baseball fields and continuing behind the homes on Bayberry Lane. There is also a large scour hole downstream of OT-03 from the Forestview Street road culvert that is a good candidate for local stream repair.

The overall rating for this reach is “Poor” due to a combination of severe bank erosion, limited vegetated buffer width, floodplain encroachment, and marginal floodplain habitat.



The stream has poor channel substrate, no vegetated buffer, and little shaded canopy cover.



Severe bank erosion in the form of undercut banks are prevalent along this reach.

THR-04

Stream reach THR-04 originates from a pond in the upstream portion of the subwatershed, flows through a forested area with a good buffer, then flows adjacent to a few homes that are near Thrushwood Lake. The end of the reach is the confluence with Thrushwood Lake. The biggest problem observed in this reach is the impacted buffer from lawn encroachment and invasive species along bank, including multiflora rose near the neighborhood. Overall, the stream reach is rated “Fair” since the in-stream habitat and floodplain habitat are marginal.

2.2.7 Island Brook

Island Brook is a main tributary to the Pequonnock River flowing from Island Brook Park in Trumbull, crossing Route 15/Merritt Parkway to Lake Forest. Flowing from Lake Forest through high-density residential areas of Bridgeport, eventually crossing Route 25/Route 8 through an approximately 0.2-mile underground culvert and discharging to a highly industrialized area of the city to the confluence with the Pequonnock River.

Approximately 1.9 miles of Island Brook were assessed, including reaches ISL-01, ISL-02, ISL-03, ISL-03B, ISL-04, ISL-06, and ISL-12.

ISL-01

Reach ISL-01 flows from the double box culvert that conveys the stream underneath the city for approximately 0.2 miles through a dense industrial zone in Bridgeport to the confluence with the Pequonnock River. Access was not possible along this reach since privately-owned land along the river has been fenced or gated for the entire reach on both sides. Some limited observations of the reach were possible from one open gate along the right bank near the double-box culvert and along the left bank inside a fenced parking area. Using this limited observation and aerial mapping, the reach was rated “Marginal”. The biggest problem in this reach is the impacted buffer and inaccessibility. Although the stream is highly encroached and there is little buffer, the banks of the stream remain mostly unaltered and have fair in-stream and bank habitat. However, beyond the banks, there is no connectivity to the floodplain. A cormorant and a heron were observed along the river near the confluence with the Pequonnock River.



ISL-01 is highly encroached and inaccessible to the public.

ISL-02

Reach ISL-02 of Island Brook is an entirely underground section of the stream conveyed in a double-box culvert approximately 15 feet wide and 6 feet in height through a dense commercial and industrial section of Bridgeport. The entrance to the culvert is at Capital Avenue and water discharges just past Route 1/North Avenue. The culvert is not necessarily a fish blockage. The reach has a rating of “No Value” since it is entirely underground, has no natural bank of floodplain, and has no in-stream or floodplain habitat value.



Reach ISL-02 is an underground culvert.

ISL-03B

ISL-03B is a short, approximately 550 foot segment that flows from an arched culvert stream crossing at Olmstead Street (the entrance driveway to Park Cemetery), through a channelized section between the cemetery and the Aquarion Water Company building parking lot, to the double-box culvert at Capital Avenue. The biggest problems with this stream reach are the lack of canopy cover, lack of floodplain connection, and invasive species growing in the stream and on the banks. The reach is rated “Poor”.



ISL-03B is channelized with rip-rap and placed stone in the stream channel.



Invasive species thrive along this reach due to the lack of canopy cover which provides full sun.

ISL-03

Reach ISL-03 flows from behind Svihra Park to the stream crossing at Olmstead Street. The segment flows behind Read Elementary School and adjacent to Hart Street, an industrial area. The right bank is steep in this section and there is evidence of some bank failure due to the encroachment of Hart Street. The left bank is in good condition with a wooded buffer of greater than 50 feet. Of the three outfalls along this reach, two have problems. OT-02 is a 36-inch outfall at the corner of Hart Street and Hawley Avenue that had substantial dry-weather

discharge at the time of the field assessments. The water was a milky white color and was investigated by Save the Sound and determined to be coming from illegal connections of residential homes. OT-03 discharges stormwater from behind the Read Elementary School. There was a large scour hole and pool with standing water downstream of the outfall. Tires and various trash items were also present in this area. The biggest problem in reach ISL-03 is illegal dumping of waste in the stream channel. Some of the items found in the stream are shopping carts, approximately 50-100 tires, car parts, various plastic pieces, PVC piping, tennis rackets, and crates. This stream reach is an excellent opportunity for volunteer stream cleanup.



Dry-weather discharge at OT-02 was determined to be illegal connections of residential discharge.



Illegal dumping of waste in the stream channel in RCH-03.

ISL-04

Stream reach ISL-04 flows from the road crossing at the intersection of Summit Street/Chopsey Hill Road with Pond Street to the approximate location of the cul-de-sac at the end of Fairview Avenue. The stream buffer on the left bank impacted through the entire reach due to residential property encroachment. There has been significant bank alteration by homeowners along this reach, including the construction of stone walls, storage structures, and yards and gardens close to the stream bank. A man-made cobble/stone dam has been constructed behind a residential property and should be removed.

There are many outfalls along this reach, between 3 and 24-inches in diameter. All of the outfalls are yard drains except for OT-03 and OT-04, which discharge road drainage from Pond

Street. OT-04 is a 24-inch pipe that had dry-weather flow. ISL-04 had moderate amounts of trash, including tires and household waste that could be cleaned up with volunteers and trash bags. The reach is rated “Marginal” due to the impacted buffer and invasive species problems in this reach. Overall, instream habitat is sub-optimal, bank erosion and floodplain connection are poor, and the floodplain vegetation is mostly turf/grass along this reach. Stream buffers along this reach have been severely impacted.



The biggest problem along reach ISL-04 is impacted buffers on residential properties. Many structures are built close to the stream bank (left) and a stone wall was constructed as a retaining wall to the river (river). Buffer encroachment prevents adequate connection to the floodplain.

ISL-06

Stream reach ISL-06 flows from Woodrow Avenue in Bridgeport to the start of ISL-04 at the stream crossing at Summit Street/Chopsey Hill Road and Pond Street. A significant portion of the reach is channelized. The upstream portion of the reach has 3-4 foot retaining walls on both sides of the stream, some of which have been undercut and collapsed. The downstream portion of the reach is channelized with stones, creating deeply entrenched retaining walls, approximately 10 feet in height. These areas of channelization are also problematic due to impacted buffer with stone walls on private property. Invasive species were severely overgrown in one section of the reach preventing a stream walk. There appears to be a frequent illegal household waste dumping site located off of Saunders Road at the stream crossing.

ER-01 is a section of the reach that had severe bank erosion due to upstream development. It provides a good example of how residential developments increase impervious surfaces, increase storm volumes and peak flows in the stream and cause downcutting of stream channels and banks. In this case, channelization efforts downstream of the development have increased the stream and bank erosion problems by disconnecting the stream from the floodplain, thereby increasing the flow velocity during storm event.

This stream reach is rated “Poor” overall due to marginal in-stream habitat, severe bank erosion and little to no floodplain connection.



Stream channelization near the Chopsey Hill Road stream crossing disconnects the stream from the floodplain, increasing peak flow velocity.



Retaining walls in this section of the reach are being actively undercut due to upstream development and lack of floodplain connection. Japanese Knotweed and other invasive species are prevalent in this area.

ISL-12

ISL-12 is the most upstream reach of Island Brook and Ehram Pond, a neighborhood stormwater pond, is believed to discharge to this reach of Island Brook through a culvert discharging to the reach on Grove Street. ISL-12 flows from Grove Street, through a short section of wooded land into Island Brook Park. The recreational park includes playing fields, tennis courts, and a playground. The downstream end of the reach is at the stream crossing with Melrose Avenue.

Previous stream and stormwater restoration projects at Island Brook Park have included constructed wetlands, a large stormwater detention pond, and stream bank stabilization along the length of the stream that is inside the park. Since this park is owned by the City of Trumbull, it is a good candidate for additional restoration and maintenance of the existing improvement projects. Follow-up investigations are recommended for the area of constructed wetlands since some invasive and/or non-wetland plants are growing in the area, the culvert underneath the playground could be day lighted, and OT-04 is a good restoration candidate since it discharges to sandy soils and is highly eroded around the outfall. Additional buffer planting along portions of the reach with turf/grass planted to the stream bank and buffer around the stormwater pond is recommended to improve water quality.

The overall stream conditions of this reach are optimal to suboptimal since there is good vegetative protection and little bank erosion. The vegetated buffer width is marginal, although the floodplain connection and habitat are suboptimal to optimal. The overall survey reach is rated "Good."



The buffer of the large stormwater pond inside Island Brook Park is mostly turf, although there is adequate space for plantings to improve the buffer.



The sand substrate near OT-04 has eroded and is a good restoration candidate.

2.2.8 Lower Pequonnock River

The Lower Pequonnock River subwatershed is the most urbanized subwatershed in the Pequonnock River. The stream reaches in this subwatershed are tidally influenced. Reaches LPR-01 through LPR-03 are too wide and deep to conduct a stream walk. Some areas along this reach are evaluated in the uplands assessment described in *Section 2.3*. LPR-04, LPR-05/06, and LPR-07 were evaluated in the field.

LPR-04

Stream reach LPR-04 flows from the underground conduit beneath Route 1 and a shopping center to Roosevelt Street/Island Brook Avenue through an industrial section of Bridgeport. The buffer is impaired along the entire reach since industrial, residential, and construction buildings and parking areas exist close to the stream banks. The average vegetated buffer along this reach is approximately 10 feet. Some bank armoring is present near the stream crossing at Roosevelt Street/Island Brook Avenue where a stone retaining wall was constructed. There are 4 outfalls along this reach ranging from 12 to 36-inches in diameter. OT-04 had some erosion in the downstream pool. There was a variety of trash and debris observed along the stream reach, although the majority was small in size and could be cleaned up with trash bags and volunteers, with the best access by boat rather than through the stream channel.

The overall in-stream condition is rated “Marginal” and the floodplain connection is rated “Poor” due to the impacted buffer throughout the reach. The overall buffer and floodplain connection is rated “Poor” due to little vegetated buffer width, poor floodplain connection and habitat and significant floodplain encroachment. Overall, the LPR-04 stream reach is rated “Poor”.

LPR-05/06

Stream reach LPR-05/06 is an underground culvert flowing from Chosey Hill Road/Route 1 to Roosevelt Street/Island Brook Avenue. The reach flows from a triple box culvert inlet beneath Route 1 and a shopping center and discharges through a triple box culvert inside Beardsley

Park. The reach is rated “Poor” and given a score of “0” since the underground concrete culvert does not provide in-stream habitat or provide buffer or floodplain connection.



Reach LPR-05/06 is an underground culvert discharging at a triple box culvert in Beardsley Park.

LPR-07

Stream reach LPR-07 flows from Bunnell’s Pond Dam and fish ladder, through Beardsley Park adjacent to the public ice skating rink and tennis courts and ends at the triple box culvert at Route 1/Chospey Hill Road. The tidally influenced portion of the stream ends approximately 50 feet from the triple box culvert. There are three outfalls along this reach, OT-03, OT-04, and OT-06 that have iron bacteria problems due to the pipe material. OT-05 has significant dry-weather flow and the source should be investigated. In addition, the flow appears to be coming from beneath the pipe rather than being conveyed inside the concrete pipe due to cracking in the pipe. There are significantly impaired buffers along the reach near the tennis courts where there is adequate space for tree plantings and additional vegetation improvements. The cement culvert just upstream of the box culvert was determined to be a fish barrier due to the low flow. There is a proposed project to construct a fish apron to increase the depth of flow in the channel during periods of the low flow.

The in-stream habitat along this reach is rated optimal since there is a good mixture of substrate and many pools and riffles. The vegetative protection is marginal to suboptimal, with the middle of the reach having the best buffer. The reach has little bank erosion and good floodplain connection. Although the stream has good floodplain connection, most of the vegetation along the banks is turf and could be improved with plantings. The overall buffer and floodplain is rated “Marginal”.



The construction of a fish apron across this concrete culverted section of the reach would allow fish passage during periods of low flow.



Iron bacteria is present downstream of discharge from iron outfall pipes along this reach. Although the orange bacteria are unsightly, it is not toxic.



A fish ladder provides an access route to Bunnell's Pond from reach LPR-07.



The vegetated buffer along LPR-07 is mostly turf; however, there is plenty of space for more tree plantings.

2.3 Upland Assessments

Fuss and O'Neill conducted upland assessments in the Pequonnock River watershed between October 14th, 18th, 19th and 20th, 2010. The field observations assist in identifying pollution prevention and potential upland restoration opportunities in the watershed. Factors that were considered in the selection of areas for assessment include:

- Stream condition (assessed during stream corridor inventory)
- Site proximity to streams and wetlands
- Land use type and development density
- Land ownership
- Restoration potential

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a

“windshield survey” evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the watershed are: (1) hotspots, (2) residential neighborhoods, and (3) streets and storm drains.

The upland assessments were concentrated in the priority subwatersheds that were identified in the comparative subwatershed analysis. Locations of the upland assessments are shown on the subwatershed maps in *Appendix A*. Field data forms that were completed during the upland assessments are provided in *Appendix C*.

2.3.1 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods is an important consideration for this study, since residential land use is the predominant land use in the Pequonnock River watershed. Neighborhood source assessments were conducted to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that affect stormwater and water quality were assessed by evaluating the following source areas in “representative” neighborhoods throughout the subwatershed:

- Yards and lawns
- Driveways, sidewalks, and curbs
- Rooftops
- Common areas

Neighborhoods were selected for assessment based on their proximity to stream corridors and their overall potential to contribute pollutants to the receiving waters. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments). One field sheet was completed for each neighborhood assessed. The locations of the selected neighborhoods are summarized in *Table 2-4* and shown on the map in *Figure 2-2*.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on readily observable features such as lawn care practices, drainage patterns, pavement staining, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.

Table 2-5. Neighborhood Source Assessment Summary

Neighborhood/ Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Grove Street & Fairchild Rd	ISL	Medium-density single family	None	Low
Lakeside Drive	ISL	Medium-density single family	Moderate	Moderate

Table 2-5. Neighborhood Source Assessment Summary

Neighborhood/ Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Chamberland Avenue & Pond Street	ISL	High-density single family	Moderate	Low
Pinewood Trail	LBH	Medium-density single family		
Armstrong Place & Maple Street	LPR	Medium-density, multi-family	Moderate	Moderate
Public Housing - Clifton House	LPR	High-density, multi-family (Public Housing)		
Garfield Ave	LPR	High-density single-family	Moderate	Moderate
Regency Meadows	MPT	High-density single family	Moderate	Low
Teller Road & Skating Pond Road	MPT	Low-density single-family		
Shelter Rock Road	UBH	Low-density single-family	None	Low
Flint Ridge Road	UPR	Low-density single-family	Moderate	Low
Aspetuck Lane	UPR	Low-density single-family	Moderate	Low
Northbrook Townhouses	UWB	Medium-density, multi-family (Townhouses)	Moderate	Low

Grove & Fairchild

The Grove and Fairchild neighborhood is located in the Island Brook subwatershed and is approximately 50 years old. The homes are built on ¼ to ½-acre lots and the area is connected to sewer. The landscaping consists of approximately 40% impervious cover due to the small lot sizes with approximately 50% grass. It is believed that the neighborhood stormwater runoff is conveyed to a stormwater pond that is managed by the Trumbull Department of Parks and Recreation. Some properties have mature trees. There were no definite sources of pollution observed in this neighborhood. The area may be a good candidate for rain barrels or rain garden promotion.



Typical home in the Grove & Fairchild neighborhood.

Lakeside Drive

Lakeside Drive is located in the Island Brook subwatershed adjacent to Lake Forest. The neighborhood has a homeowner's association. The majority of the homes are single-family detached homes on a 1/4-acre lot. The average age of the neighborhood is estimated to be 80 years, however there is evidence of infill development and redevelopment. Lake Forest functions as a stormwater pond for the neighborhood. The storm drain inlets have placards attached to them; however, at least one inlet was obstructed by leaves and organic material.



Typical lakeside home.



Lake Forest is adjacent to the neighborhood.

Chamberland Avenue & Pond Street

The Chamberland Avenue & Pond Street neighborhood is located in the Island Brook subwatershed and consists of single-family detached homes on 1/4-acre lots. There are no observable pollution problems in this neighborhood.



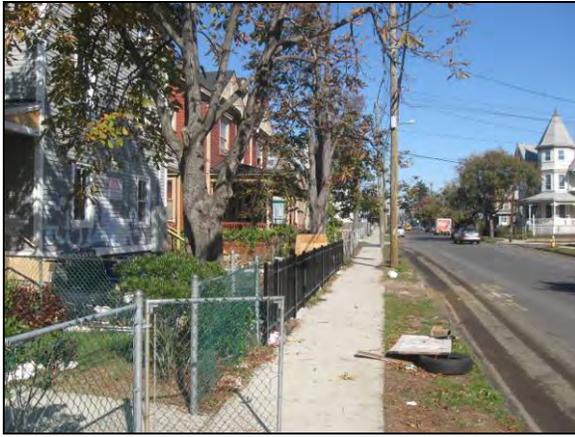
Single-family detached home along Pond Street.

Pinewood Trail

The Pinewood Trail subdivision is located in the Lower Booth Hill Brook subwatershed. The homes may be part of a homeowner's association, which would increase the likelihood of retrofit projects being organized and completed. The single-family detached homes are on $\frac{1}{4}$ -acre lots with approximately 40% impervious and 40% grass cover. Some of the driveways were stained with oil, however the curb and gutter was clean and not breaking up. Many of the downspouts (approx. 70%) drain to pervious surfaces. A recommendation for this neighborhood is to improve the buffer to the lake.

Armstrong Place & Maple Street

The Armstrong Place and Maple Street neighborhood has a mixture of single-family detached homes on less than $\frac{1}{4}$ -acre and some multifamily homes. The neighborhood is estimated at 120 to 140 years old and none of the properties have garages or basements. The neighborhood is located in the Lower Pequonnock River subwatershed in an urban portion of Bridgeport. The lots have around 90% impervious cover since the houses and multi-family homes are on small lots. Sewer service is available in the area and it is assumed that approximately 80% of the homes' downspouts are connected directly to the storm or sewer systems. Armstrong Place is believed to have had sewer separation project and street repaving recently. About half of the yards contained trash, mostly from redevelopment efforts. There are a few empty lots within the neighborhood that are entirely covered in construction debris.



Homes along Maple Street.



Armstrong Place has been recently paved following a sewer separation project.

Public Housing - Clifton House

The Clifton House is a public housing building adjacent to Riverfront Park on Main and Lumber Streets. The facility has a large parking area and is surrounded by open space areas that have the potential for on-site stormwater retrofits. In addition, the property is located downgradient of a large stormwater collector line where stormwater could be diverted into a large water quality or infiltration structure.



Clifton House public housing and adjacent open space area.

Garfield Ave

Garfield Avenue is located on the western side of the Pequonnock River watershed in a densely populated section of Bridgeport, north of Capital Avenue. The neighborhood is composed of 2-family homes on less than 1/8-acre lots. The lots have approximately 90% impervious surfaces on average since the home, driveway and sidewalk take up most of the lot. There is a

curb and gutter present along the street with many cars parked long-term on the street causing sediment, oil & grease, and trash and litter along the street. This neighborhood is a good candidate for street sweeping, and catch basin stenciling. The lawn areas are too small for rain gardens or downspout disconnections.



Garfield Avenue is a two-family housing neighborhood with evidence of long-term on-street parking.



The neighborhood has a high percentage of impervious surfaces due to the small lot sizes.

Regency Meadows

The Regency Meadows neighborhood is in the Middle Pequonnock Tributaries subwatershed along Regency Circle in Trumbull. The neighborhood is believed to have a homeowner's association. The homes are single-family attached townhouses located on 1/8-acre lots. All of the homes have basements and garages and the neighborhood is less than 5 years old. Many, if not all, of the homes have permanent irrigation systems and appear to fertilize the lawns, which may increase the contribution to non-point source pollutant runoff from the neighborhood. The downspouts are directly connected to the storm drains or sanitary sewers and there is plenty of lawn area for rain gardens. The neighborhood does have a stormwater pond, although a gully has formed in the bottom sediment causing short-circuiting through the pond. A stormwater pond retrofit is recommended to install a forebay for sediment retention. The storm drain inlets should be stenciled in this neighborhood.



Townhouses on Regency Circle are less than 5 years old and have high turf maintenance.

Teller Road & Skating Pond Road

The Teller Pond and Skating Hill Road neighborhood is located in the Middle Pequonnock Tributaries subwatershed and is single-family detached homes on an acre or greater lots. There is no sewer service in this area. The neighborhood is approximately 30 years old and has mature trees that shed leaves that have collected in the curb and gutter and in the storm drain inlets. A street cleaning is recommended in this neighborhood in the fall to remove fallen leaves and prevent storm system clogging or backup.



The mature trees in this neighborhood cause leaves to fill the curb and gutter system in the fall.

Shelter Rock Road

The Shelter Rock Road neighborhood is a low-density single-family development in the Lower Booth Hill subwatershed. The neighborhood is approximately 40 years old and has more than 50% canopy cover on most lots. The houses are on lots typically 1 acre or greater and the turf management is medium to high, inferring that only a portion of the lawns are fertilized and watered. There are no obvious sources of pollution in this neighborhood.



Homes on Shelter Rock Road typically have good canopy cover.

Flint Ridge Road

The Flint Ridge Road neighborhood is located in Monroe in the Upper Pequonnock River subwatershed. The neighborhood is estimate to be 30 years old and the homes are on greater than 1 acre lots. All of the houses have garages and basements with septic fields. There are mature trees on many of the properties. The streets and catch basins are generally clean, however they are not stenciled.



The homes on Flint Ridge Road are on greater than 1 acre lots with high turf management.

Aspetuck Lane

The neighborhood along Aspetuck Lane is a short dead-end street off of Cutler's Farm Road in Monroe located in the Upper Pequonnock River subwatershed. There are currently 10 houses in the subdivision on less than ¼-acres lots that are less than 5 years old. There are no obvious signs of pollution from this neighborhood, however all of the lawns are equipped with permanent irrigation systems and all of the downspouts are directly connected to the storm drains.

Northbrook Townhouses

The Northbrook subdivision is a multi-family subdivision of townhouse-style residences, approximately 130 acres in size located in the Upper west Branch subwatershed. The subdivision is approximately 20 years old and includes a clubhouse and swimming pool for the residents. There is not sewer service to this neighborhood and a large septic field is located within the development upstream of one of the two stormwater ponds. Geese were observed on the grass area adjacent to one of the ponds, although there were clear signs distracting residents from feeding the geese.



Typical Northbrook townhouses.



A sign discouraging wildlife feeding near a stormwater pond.

2.4 Hotspot Site Investigation

Hotspot site investigations were conducted for representative sites with higher potential to contribute polluted stormwater runoff to the storm drainage system or receiving waters. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transportation-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.

The hotspots examined in the field were located within the Lower Pequonnock River, Lower Wash Brook, Middle Pequonnock River, Middle Pequonnock Tributaries, Thrushwood Lake, and Upper West Branch Pequonnock subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including transportation-related, commercial, industrial, institutional, and community/municipal sites. Sites are identified by the watershed abbreviation, followed by “HSI” and a numeric identifier. *Table 2-6* summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately-owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.

Table 2-6. Hotspot Site Investigation Summary

Location	Address or Cross Streets	Subwatershed	Land Use
Bridgeport Public Works	581 North Washington Avenue, Bridgeport	LPR	Industrial
Zwally's Hauling	River Street and North Washington Avenue, Bridgeport	LPR	Industrial
B & C Sand and Gravel	Housatonic Avenue, Bridgeport	LPR	Industrial
Fire Station	Congress Street, Bridgeport	LPR	Industrial
Sippin Energy	234 Main Street, Monroe	LWB	Industrial
Chuck's Corner Shopping Center	Route 25 at Judd Road, Monroe	LWB	Commercial
Home Depot	Sylvan Avenue, Bridgeport	MPR	Commercial
Helicopter Service - Quarry Rd	Quarry Road, Trumbull	MPR	Industrial
Bow Tie Cinema - Quarry Rd	Quarry Road, Trumbull	MPR	Commercial

Location	Address or Cross Streets	Subwatershed	Land Use
Trumbull High School	Strobel Road, Trumbull	MPR	Institutional
Office Park	204 Spring Hill Road, Trumbull	MPT	Commercial
Trumbull Printing	205 Spring Hill Road, Trumbull	MPT	Industrial
Bus Maintenance Yard & Transfer Station	Spring Hill Road	MPT	Transportation-related
Athletic Fields	345 White Plains Road, Trumbull	THR	Institutional
Mulch & Topsoil Company	Route 25 at Pepper Street	UWB	Industrial
Adams Materials - Quarry	64 Cambridge Drive, Monroe	UWB	Industrial
Adams Materials - Landscaping Supply	64 Cambridge Drive, Monroe	UWB	Industrial
Manufacturing Co. Enterprise Drive	Enterprise Drive, Monroe	UWB	Industrial

Bridgeport Public Works

The Bridgeport Public Works facility is located in the Lower Pequonnock River subwatershed at 581 North Washington Avenue in Bridgeport. The public works facility has an operations building and storage yard for various maintenance equipment, roll-offs, fencing, trucks, and various construction equipment. Approximately 10 fleet vehicles were being stored on site at the time of the field visit. Since the crews did not gain site access, the evaluation was conducted from outside of the perimeter of the storage yard. The condition of the dumpsters at the facility appeared to be good and all roll-offs (approx. 10) were covered. The parking lot was gravel, which has potential to contribute sediment to the stormwater system in runoff; however the condition of the gravel appeared to be good. This site may have potential for an on-site retrofit or a potential retrofit at the time the yard is paved, if ever.

Zwally's Hauling

Zwally's Hauling operation is located on River Street and North Washington Avenue adjacent to the Pequonnock River. Fleet vehicles are maintained, repaired, washed and stored on the premises outdoors. A vehicle was being washed during the field crew assessments and the wash water was draining directly to the Pequonnock River without diversion. The downspouts from the building also drain directly to the paved surface and then to the River. This is a likely hotspot since the facility has a stained parking area, no diversions for wash water, and is adjacent to the Pequonnock River.



Truck wash water from Zwally's Hauling drains directly to the Pequonnock River.

B & C Sand and Gravel

B & C Sand and Gravel is an industrial storage and delivery company dealing in bark mulch, topsoil, sand, and gravel. The company is located between Housatonic Avenue and the Pequonnock River. Field crews were not granted access to the site, however it was ascertained from the perimeter of the facility that the site containing large, uncovered sand and gravel piles and a truck washing station for trucks leaving the site. It is unknown if the site contains a fueling station or stores and/or maintained vehicles. The site does not appear to have a stormwater pond based on aerial imagery, which would be recommended considering the size of the site and the uncovered materials piles. This site may be regulated under NPDES.

Fire Station

A Bridgeport Fire Department building is located on Congress Street adjacent to Riverfront Park and the Pequonnock River. A fueling station is located outdoors without cover, however does have proper secondary containment. There were no observable problems with this facility.

Sippin Energy

Sippin energy is an oil and energy fuel supplier located on Route 25 in Monroe. The facility is regulated due to the large fuel tanks stored on site. The facility has proper secondary containment and a covered fueling area.

Chuck's Corner Shopping Center

Chuck's Corner Shopping Center in Monroe is located in the Lower West Branch Park River subwatershed and is representative of many of the commercial strip stores along Route 25 in Monroe. The West Branch of the Pequonnock River flows behind the shopping center. The storm drains and roof leaders are connected directly to pipes that have outlets directly to the stream, without treatment.



Downspouts discharge to impervious surfaces at Chuck's Corner Shopping Center.

Home Depot

A Home Depot shopping center is located on Sylvan Avenue in the Middle Pequonnock River subwatershed. The parking lot appears to be oversized for the store, creating more impervious space than is necessary. A stormwater pond was not found on the site and is recommended for this site. However, the steep slopes around the parking lot may prevent any retrofits.

Helicopter Service – Quarry Road

Helicopter Service Inc. (HSI) is located on Quarry Road in Trumbull in the Middle Pequonnock River subwatershed close to the Pequonnock River. The parking lot has a significant amount of stored materials that are uncovered; however there did not appear to be any liquid storage items. There are loading and unloading operations at the site. It is recommended that the outdoor storage be moved to a covered location. The facility stormwater drains to a large dry detention pond along Quarry Road.



A large dry detention stormwater basin collects runoff from the site and provides water quality and quantity treatment.



The outdoor material storage area is uncovered.

Bow Tie Cinema – Quarry Road

The Bow Tie Cinema is located on Quarry Road in Trumbull near the Pequonnock River. The movie theater and large parking lot are approximately 10 years old. The facility has a large dry detention basin that could be used as an example of good water quality and quantity treatment in the watershed. In addition to the dry basin, many of the catch basins are located at the bottom of grass swales to allow for some infiltration prior to entering the storm drainage system.



The catch basin is located in a grass swale to allow for infiltration prior to entering the storm drainage system.



This large dry detention pond is a good example of water quality and quantity treatment from the Bow Tie cinema parking lots.

Trumbull High School

The Trumbull High School and the Regional Agriscience and Biotechnology program on Strobel Road in Trumbull is located in the Middle Pequonnock River subwatershed. The campus and ground of the two schools are large, including multiple buildings, athletic fields, parking areas, and agriculture school storage. At the time of the field visit, reconstruction of a portion of the high school was underway. The biggest potential problems at this site are the outdoor storage at the agricultural school, including farm equipment and materials, and the fertilizer runoff from the athletic fields.



The Regional Agriscience and Biotechnology program.



Uncovered outdoor storage at the Agriscience and Biotechnology school.

Office Park (204 Spring Hill Road)

The commercial office park located at 204 Spring Hill Road in Trumbull is a potential hotspot location in the Middle Pequonnock Tributaries subwatershed due to the waste management activities, loading operations, and downspouts discharging to impervious areas. There were no observed pollution sources around the building during the site visit.



Runoff or leaking from these dumpsters would drain to the stormwater drainage system.



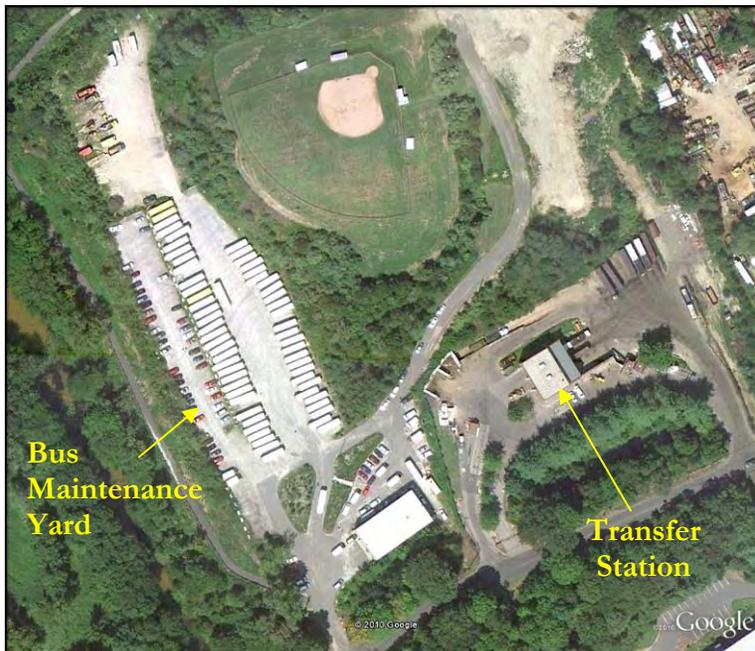
Loading and unloading operations in the rear of the facility.

Trumbull Printing

The Trumbull Printing office is located at 205 Spring Hill Road in the Middle Pequonnock Tributaries subwatershed. The building is a mixed commercial/industrial facility that has loading and unloading operations, outdoor storage materials which lack cover, and garbage storage outside. This location is not a hotspot.

Bus Maintenance Yard & Transfer Station

The Trumbull bus maintenance yard and transfer station is located in the Middle Pequonnock Tributaries subwatershed. The facility stores approximately 100 school buses and operations include maintaining, repairing, fueling, and washing the buses. There is an uncovered fueling area. Since the field crew did not gain access to the site, the waste operations were not evaluated and should be included in future follow-up inspections.



The bus maintenance yard and transfer station are located on Spring Hill Road in Trumbull.

Athletic Fields

The Athletic Fields at Unity Park are located in the Thrushwood Lake subwatershed. The biggest problem for non-point source pollution at the athletic fields is the high turf maintenance practices which can contribute fertilizers to stormwater runoff. The turf at the athletic fields is irrigated and the stormwater runoff is conveyed directly to the storm drainage system. Improvements to the large-scale turf maintenance practices at these fields would improve water quality.



The runoff from a large parking lot at the athletic fields is a good candidate for a stormwater retrofit.

Mulch & Topsoil Company

A mulch and topsoil company is located on Route 25 north of the intersection with Pepper Street in the Upper West Branch Pequonnock River subwatershed. Dump trucks, excavators, conveyor belts, and three chemical totes containing unknown liquid. Piles of landscaping materials, including mulch, topsoil, and possibly stone and gravel are stored on-site and loaded and unloaded into dumpster trucks. The vehicles and materials are stored outside without cover. The dumpsters on the site were found to be overflowing and without a cover. This potential hotspot should be included in any future education efforts and on-site stormwater retrofits are recommended at the site.



Mulch and topsoil are stored outside without cover.



Loading and unloading equipment is stored outside, including excavators, dump trucks, and conveyor belts. Three chemical totes are stored on-site without cover.

Adams Materials – Quarry and Landscape Supply

Adams Materials operates a quarry and a landscaping supply company in the Upper West Branch Pequonnock River subwatershed. Both operations are believed to support development of the new industrial buildings in the area along Enterprise Road. The operations at the quarry could not be evaluated without permission for an on-site assessment. However, it is clear that mining and loading and unloading of stone and gravel materials at this site have the potential to

influence water quality in the Pequonnock River. Follow-up should be made to determine if the site has a NPDES permit.



A quarry and landscape supply company are located on Enterprise drive and are believed to supply construction and landscaping materials to the new industrial development in the area.

Manufacturing Company on Enterprise Drive

A manufacturing company has operations on Enterprise Drive, the new industrial development in the Upper West Branch Pequonnock River that is believed to be less than 5 years old. The operations are primarily indoors and there are no vehicle operations associated with the business. On-site stormwater controls are evident on the property and off-site controls are located downstream of the property, including a large, newly constructed stormwater basin on Enterprise Drive. The property has approximately 20% bare soil due to new plantings at the site, and approximately 40% landscaping. A concern at on the site is the waste management, including garbage and construction materials stored outside without cover. In addition, the dumpsters in the rear of the building are located near a stormwater catch basin, are not covered, and appear to be leaking.



Uncovered dumpsters are near a storm drain and appear to be leaking.



A large stormwater basin was recently constructed to treat runoff from the new and proposed industrial development along Enterprise Drive in Monroe.

2.5 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be evaluated to assess the effectiveness of existing maintenance practices for reducing pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted between October 14th, 18th, 19th and 20th, 2010. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. General findings of the street and storm drain assessments are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as *Figure 2-4*.

Residential Land Use

In general, the low- to medium-density residential neighborhoods have pavement in good condition and the streets and storm drains are clean, with the exception of sediment and organic material build out in a few of the catch basins are grates. Many of the drains were not stenciled. Some of the neighborhoods had a homeowners association that increases the likelihood of implementing stormwater control recommendations. The higher-density residential neighborhoods were observed to have a higher rate of sediment buildup on the street and some oil and grease staining from long-term car parking on the street. The biggest problem observed at the residential storm drains was the buildup of leaf litter.

Commercial and Industrial Land Uses

Typically, the streets and storm drains at commercial and industrial facilities were free of litter and leaf debris. Some were observed to have buildup sediment in the catch basin sump. The condition of the pavement was generally good with some cracks and breakup at some locations. The sites generally have good accessibility to vacuum trucks. The biggest problem at the commercial and industrial facilities is neglected maintenance of the catch basin cleanouts. It is recommended that catch basins at industrial and commercial facilities throughout the watershed be cleaned regularly.

The majority of the storm drains observed during the field assessments were not stenciled to indicate their discharge point. All areas of the watershed could benefit from storm drain stenciling and similar watershed stewardship signage, particularly for drainage systems that discharge directly to the Pequonnock River or its tributaries.

Location	Storm Drains		Streets
Enterprise Drive			
Northbrook Drive			
Chestnut Street/ Grove Street/ Fairchild Road		<i>[Photograph Not Taken]</i>	
Lakeside Drive			
Flint Ridge Road			
204 Spring Hill Road			<i>[Photograph Not Taken]</i>

Location	Storm Drains		Streets
Spring Hill Road			
Commuter Lot Route 111 & Route 25			
Skating Pond & Teller Road			
Shelter Rock Road			
North Washington Avenue and Knowlton Street			
Armstrong Place			

Location	Storm Drains		Streets
Garfield Avenue			

Figure 2-4. Streets and Storm Drain Assessment Photographs

3 References

Fuss & O'Neill, Inc, (2010). Baseline Watershed Assessment: Pequonnock River Watershed. City of Bridgeport.

Kitchell, A. and T. Schueler. (2005). Urban Subwatershed Restoration Manual No. 10: Unified Stream Assessment: A User's Manual (Version 2.0). Center for Watershed Protection.

Wright, T., Swann, C., Cappiella, K. and T. Schueler. (2005). Urban Subwatershed Restoration Manual No. 11: Unified Subwatershed and Site Reconnaissance: A User's Manual (Version 2.0) Center for Watershed Protection.

Appendix A

Field Inventory Subwatershed Maps



Appendix B

Stream Corridor Assessment Field Data Forms



Appendix C

Upland Assessment Field Data Forms



Appendix D

Photographs on CD

